of substances represents the only repugnatorial material possessed by Chromodoris. It seems possible that the oily element of the secretion is particularly involved in the production of the curiously penetrating odor which the nudibranch emits, and that some other substance is also concerned in determining the general distasteful quality.

Incidentally, the glands cannot be implicated in any mutual attraction between individuals at the time of pairing, for animals from which the glandular equipment has been completely removed, are found to mate readily and deposit normal egg masses.

I have commented above on the suggestive appearance of protection evidenced by the inturning of the posterior beaded border of the mantle. A closer analysis shows, however, that any protection which is in this way afforded to the conical glands is purely incidental. For if the projecting "tail" of the nudibranch is stimulated (as with induction shocks), the beaded portion of the mantle is not rolled under upon itself, but is spread out so that the openings of the glands point in the general direction of the irritated area. Their discharge under these circumstances may occasionally be seen. I therefore believe that the ventralward inflection of the gland-bearing portion of the mantle is primarily a reaction having to do with the normal discharge of the glands. When the nudibranch is attacked at the side, or anteriorly, the glands are thus given an opportunity to discharge a part of their contents in an appropriate direction.

A full account of these observations will be published later.

Agar's Island, Bermuda.

THE ANATOMY OF CONTRADENS CAMBOJENSIS (SOW.) (NAYADES).

BY DR. A. E. ORTMANN.

Two specimens, male and gravid female, from Petchaburi, Siam, are at hand, received from B. H. Bailey, and collected by Dr. E. B. McDaniel.

These specimens agree very well with *Unio cambojensis* Sowerby (Conch. Icon. 18. Unio. 1866, pl. 42, f. 231), in general

shape, color of inside (rose color), and sculpture of outside. Frierson, who has seen these shells, also thinks that they belong to this species.

Simpson (Descript. Catal., 1914, p. 1013) makes this a synonym of *U. rusticus* Lea (1856), and places it in the genus *Nodularia*. But Lea's shell is larger, heavier, has more elevated beaks, and coarser and more obscure sculpture. This is also evident from the figures of *rusticus* given by Haas (Syst. Conch. Cab. 9. Heft 44, 1911, pl. 21, f. 2–5 , where the species is placed in the genus *Contradens* Haas.

Haas (l. c. Heft 48, 1913, p. 173) defines this genus by the sculpture of the shell, and chiefly by the character of the hinge teeth, and describes the anatomy of two species (*C. hageni* Strub. and *verbecki* Bttgr.), which agrees fully with that of the European *Unio*. However, the glochidia are peculiar in not having a spinulose, triangular hook, but a swelling of the lower margin covered with fine spinules arranged in vertical rows. (This undoubtedly is a primitive structure, which, in its further development, leads to the hook of *Unio* and of the *Anodontinae*). Of the septa, Haas says that they are "well developed."

Anatomy of my specimens of Contradens cambojensis:

Anal opening separated from the *supraanal* opening by a moderate mantle connection ; supraanal very short, anal with inner edge nearly smooth ; *branchial* opening with papillae on inner edge. Anal and branchial openings separated by a gill-diaphragm, of the normal *Unionid*-type. No special structures on mantle edge in front of the branchial opening. *Palpi* subfalciform, large, their posterior margins united for two-thirds or almost three-fourths of their length.

Structure of gills Unionine, but in the male and in the inner gill of the female, the septa are extremely weak and scarce, almost absent.

The outer gill of the female is marsupial in its whole length, and when charged, moderately swollen, with sharp edge. *Septa* are present, and stand close, forming water tubes, *but the septa are incomplete, interrupted*, so that the water-tubes (ovisacs) communicate with each other. In the charged and distended marsupium, the septa practically are replaced by rows of somewhat

irregular, subcylindrical, transverse pillars between the two laminae. This interrupted character extends through the whole gill, and by the arrangement of these pillars in rows, parallel to the gill-filaments, their homology with the septa of the *Unionidae* is indicated. There are no secondary water-tubes.

The *glochidia* (pl. 4, fig. 10) fill the whole interior reticulate space in the gill, and they do not stick together so as to form distinct placentae. *Their shape is very peculiar:* transversely elliptical, nearly kidney-shaped, *i. e.*, the outline is subelliptical, with one long side of the ellipse slightly cut away by the hinge margin. Thus they are much longer than high : L., .025, H., .021 mm. In addition, on the posterior end (the end nearer the adductor muscle), there is a gentle emargination, but only on one valve (right or left?), thus producing a slight gap on the margin. The ventral margin does not show any indications of a thickening or of the presence of spinules (such as figured by Haas in *Contr. verbecki*, pl. 22, f. 4).

There is no question that, according to shell characters, this species ought to be placed in Haas' genus *Contradens*. Also the anatomy agrees up to a certain point, with the exception, that here we have not "well developed" septa in the marsupium, *but the septa are perforated or interrupted.* This is a condition previousiy observed in the *Unioninae: Hyriopsis* and *Gonidea* (see Ortmann, NAUTILUS, 30, 1916, p. 86 and p. 50). It is possible that Haas has overlooked this character, and that a similar structure is more often found in Asiatic Nayades. At any rate, Haas' figures of horizontal cross sections of the gills of *Rectidens prolongatus* Drouët (pl. 26, f. 4) and of *Acuticosta chinensis* Lea (pl. 30, f. 7) suggest this (text not yet published). And further, the glochidia of *Contr. verbecki* (Haas, pl. 22, f. 4) are entirely different, as mentioned above.

For the present it is well to leave this species in Haas' genus *Contradens*, but for the final arrangement of these and the allied forms, the following facts are paramount :

1. *According to its general anatomy, it belongs to the subfamily Unioninae of the family Unionidae.*

2. The perforated or interrupted character of the septa of the marsupial gills is a peculiar feature, which has been observed in this subfamily, only in the West American genus *Gonidea*, and in the Asiatic genus *Hyriopsis*, but which is a general character in the subfamily *Hyriinae* of the family *Mutelidae* (South America and Australia).

3. The glochidia are quite peculiar, differing from those described for *Contr. verbecki*, and being dissimilar to any known Nayad glochidium.